3-2007

Trade Agreements with Domestic Policies as Disguised Protection

Gea Myoung LEE
Singapore Management University, gmlee@smu.edu.sg

DOI: https://doi.org/10.1016/j.jinteco.2006.05.002

Published in Journal of International Economics, Volume 71, Issue 1, March 2007, Pages 241-259
https://doi.org/10.1016/j.jinteco.2006.05.002

Trade agreements with domestic policies as disguised protection☆

Gea M. Lee *

School of Economics and Social Sciences, Singapore Management University, 90 Stamford Road, 178903, Singapore

Abstract

WTO rules prohibit "disguised protection" in the form of domestic policies. How then do governments cooperate over trade and domestic policies when none can verify whether a nation's domestic tax reduction is a protective measure or a reaction to a production externality? In this paper, each government privately observes whether a production externality associated with its import-competing good is high or low. This paper finds that in an optimal agreement, disguised protection with domestic policies is never used by governments with a high externality, and is never commonly realized. Moreover, in an optimal agreement, tariffs may be conditional on domestic policies.

Keywords: Trade agreement; Private information; Domestic policy; Disguised protection

JEL classification: C73; F13

1. Introduction

Tariffs have significantly been reduced under the auspices of the World Trade Organization (WTO, formerly GATT). Along with (and perhaps because of) this reduction, domestic policies such as production taxes and subsidies are receiving increased attention as a means of trade protection. Under WTO rules, however, member governments are not allowed to use domestic policies as protective measures. GATT Article III prohibits "disguised protection" in the form of domestic

☆ This paper is based on a chapter of my dissertation, submitted to Columbia University. I am indebted to Kyle Bagwell, Levent Kockesen and Michael Riordan for their guidance and help. I thank the editor, Kala Krishina, and anonymous referees for their helpful suggestions, and also thank Atila Abdulkadiroglu, Eslyn Jean-Baptiste and Raphael Thomadsen for their comments. The usual disclaimer applies.

* Tel.: +65 6828 0857; fax: +65 6828 0833.
E-mail address: gmlee@smu.edu.sg.

policies. Further, when a country is adversely affected by its trading partner's domestic policies, it is entitled to bring a "non-violation" complaint, permitted by GATT Article XXIII, even if the trading partner broke no explicit WTO rules. The non-violation complaints thus act as a legal framework under which member countries are ensured against the opportunistic use of domestic policies.

This paper examines how member governments cooperate over trade and domestic policies when they have the incentive to use domestic policies as disguised protection. To this end, it considers a two-good, two-country partial equilibrium model, and finds a self-enforcing policy agreement in an infinitely repeated game. In the model, there is a domestic production externality associated with the import-competing good and an international pecuniary externality due to the terms-of-trade effects. Production externalities are assumed to be either high or low. To simplify the exposition, we focus our attention on negative externalities, taking externality levels to be either high or low cost. The first-best policies are free trade and Pigouvian domestic tax.

The novel feature of our analysis is that at the time of making policy choices, governments are privately informed about externality levels. The implication of this is that, after agreeing on free trade, the "high-cost government" can set the low tax assigned to the "low-cost government" to improve its terms of trade without being detected as a deviation. When a government unilaterally raises its trade barrier by reducing the domestic tax applied to its import good, the off-shore price of the import good (the world price) goes down. Such a policy measure then causes a redistribution of surplus from foreign exporters, who receive lower prices, to the domestic country. This terms-of-trade effect serves to lower the cost to the domestic government of providing additional protection to its import-competing producers.[1]

Trade and domestic policy choices here are *incentive compatible*. This means that a self-enforcing policy agreement is subject to (i) the "on-schedule" constraints that each government truthfully chooses the policy choices assigned to its cost type and (ii) the "off-schedule" constraints that no government deviates from the policy agreement. The motivations for this approach are as follows. First, in practice, enforcement may pose a critical problem for an international agreement. Since WTO has no real enforcement power of its own, it relies on the independent retaliations of its members to ensure that the WTO rules are followed. Second, it is hard to restrict each government's sovereignty over its domestic policy choices. A policy agreement may not be realized unless it is in the benefit of member governments to continue to cooperate over policy choices. Third, by constructing the self-enforcing equilibria, our analysis abstracts from the assumption that a third party is able to assess and verify the trade effects of and motivations for privately-informed governments' domestic policies.[2]

The paper's first main finding is that if a trade agreement motivates the high-cost government to use domestic policies as disguised protection, then the agreement will always be improved upon by another incentive-compatible agreement that eliminates the high-cost government's disguised protection by allowing it to raise its tariff. Thus, the high-cost government never uses domestic policies as disguised protection in an optimal agreement. This finding broadly implies that trade agreements should include cooperation over domestic policies such as environmental and labor standards, so as to reduce the inefficiency that would otherwise persist due to subsequent disguised protections.[3]

[1] This interpretation of terms-of-trade effects follows Bagwell and Staiger (2001, 2002).

[2] Due to the difficulty of assessing the trade effects, legal proceedings such as non-violation complaints may not be easy to carry out. The number of non-violation complaints actually brought is small in practice. From 1947 through 1995 only 14 out of the more than 250 Article XXIII proceedings have centered on such complaints (Petersmann, 1997).

[3] This finding thus provides a justification of the recent increasing demand for the WTO to more fully address domestic policies such as environmental and labor standards.

To see how this result obtains, suppose that the high-cost government initially distorts its domestic policy under free trade. If it can choose any policy mix, as long as the world price is unaffected (the trading partner's welfare is unaffected), then the best choice would be to raise the tariff and eliminate domestic distortion, since tariff is the best instrument to internalize terms-of-trade effects.[4] In other words, if the high-cost government sets a positive tariff (alongside the Pigouvian tax) such that its trading partner is indifferent, then it will be better off departing from domestic distortion. Further, if the high-cost government sets its tariff so as to be indifferent, then (i) its trading partner will be better off, and (ii) incentive compatibility will be provided by the single crossing property: the low-cost government will not switch to the policies that are indifferent to the high-cost government, and the high-cost government will not choose the low-cost government's policies that are not preferred.

The paper next examines whether governments allow domestic distortions in the low-cost country so as to prevent domestic distortions in the high-cost country with a reduced tariff. The second main finding is that some domestic distortions in the low-cost country may be allowable to accommodate a tariff reduction in the high-cost country only if the probability of such domestic distortions being realized is sufficiently low. Domestic distortions are *never commonly* realized in an optimal agreement, since governments could otherwise be better off eliminating domestic distortions with positive tariffs in the high-cost country. This finding has two broad policy implications. First, if domestic distortions are frequently realized perhaps by countries that face strong import competition, it might be more desirable to permit tariff schedules to be conditional on domestic policies than to induce frequent disguised protections such as lax environmental standards under *uniform* tariff reductions.[5] Second, to this end, the WTO rules need a modification to accommodate the tariff flexibility that is conditional on domestic policies. As WTO rules stand now, a country that truthfully raises its domestic tax or environmental standard would not be allowed to raise its tariff.[6]

Lastly, this paper shows that free trade (where tariffs are uniformly zero) can be achieved only at the expense of domestic distortions in the low-cost country, which may be too high. In a wide range of parameters, free trade is improved upon by another agreement that reduces domestic policies in the low-cost country by allowing positive tariffs in a high-cost country. This non-optimality of free trade thus supports the previous finding that it might be welfare-enhancing to permit tariffs to be conditional on domestic policies.

Despite the mounting interest in the relationship between tariff reductions and unilateral domestic policies and the contentious issues of this relationship, no analytical papers have investigated how *privately-informed* governments cooperate over *two* policy instruments when they are tempted to use one of them as disguised protection.[7] Taking different approaches, Bagwell and Staiger (2001) and Ederington (2001) examine the interaction between tariff reductions and the choice of domestic policies.

[4] This "targetting principle" is observed in Bhagwati and Ramaswami (1963) and Johnson (1965): the optimal intervention is to use the policy that offsets the source of the distortion.

[5] Interestingly, allowing a tariff increase has been supported by the advocates of anti-free trade in a different context: countries with stringent environmental regulation should be allowed to "level the playing field" by introducing a tariff to at least partially offset the effects of high environmental standard.

[6] A similar suggestion is found in Bagwell and Staiger (2001).

[7] Feenstra and Lewis (1991) investigate an incentive-compatible tariff agreement when privately-informed governments have an incentive to overstate the political pressure for protection, assuming that there is some exogenous enforcement mechanism. In Jensen and Thursby (1990) and Riezman (1991) privately-informed governments cooperate over a single instrument (tariffs). One of the two instruments is non-negotiable in Copeland (1990), and non-observable in Hungerford (1991).

Bagwell and Staiger (2001) consider a two-stage tariff negotiating game in which the inefficiency associated with unilateral policy choices boils down to a problem with the level of market access, not with policy mix. Bagwell and Staiger show that if market access at the negotiated level is secured by the prospect of the non-violation complaints, then negotiations over tariff alone can lead to a policy mix that is efficient from a worldwide perspective. This paper departs from the work of Bagwell and Staiger as follows. First, policy agreements are self-enforced in this paper, whereas they are exogenously enforced by WTO rules in their paper. Second, their paper does not deal with a disguised form of protection, since it abstracts from the case of asymmetric information. Third, governments here design an incentive-compatible policy mix, whereas governments there negotiate over tariffs along with a market access commitment.

Ederington (2001) investigates a self-enforcing agreement in which the motivation of a nation's every policy choice is publicly observed. He finds that if any protective measure is taken, it will take the form of tariff as tariff levels are tailored to prevent an observable deviation from the agreement. This paper introduces private information into a model of self-enforcing agreement; thus, a policy agreement acts as a revelation mechanism in which hidden protective measures are prevented. The contrast between the work by Ederington and this paper becomes apparent when governments care sufficiently about the future (sufficiently patient). Whereas protective measures with tariff cease to exist in his paper since no government has an incentive to deviate, they may be necessary in this paper since governments still have an on-schedule incentive to undertax their import-competing goods.

With the presence of private information, this paper provides a new perspective on policy linkage. The previous literature investigates whether the enforcement power is increased by a linked agreement that permits cross-retaliation: a deviation in any policy induces retaliation in both policies.[8] While the literature asks whether off-schedule (non-deviation) constraints are affected by a linked agreement, this paper highlights how on-schedule (truth-telling) incentives are provided when policy linkage is possible. In this paper, the "off-schedule linkage" that permits cross-retaliation would not result in an increase in the enforcement power to prevent off-schedule deviations. The intuition is that even if retaliation with tariffs creates a stronger threat to deter a domestic-policy deviation, governments have a lower incentive to undertake a deviation using domestic policy than one using tariff. By contrast, the "on-schedule linkage" that permits tariffs to be conditional on domestic policies may enhance the efficiency of policy agreements.[9]

The rest of this paper is organized as follows. Section 2 describes the basic two-good, two-country model. Section 3 defines the repeated game and finds the parameter range in which governments under the first-best policies are tempted to undertax their import-competing goods. Section 4 argues that there are some tariff-reduction agreements on which governments can always improve. Section 5 investigates when governments do not use domestic policies as protective measures. Section 6 discusses some possibilities of model extension. Section 7 provides conclusions.

2. The basic model

This paper considers a simple two-good, two-country partial equilibrium model. Two countries, home (no *) and foreign (*), trade two goods, x and y, produced in competitive markets. Let $x(y)$

[8] See, for example, Ederington (2002, 2003), Limão (2005), and Spagnolo (2001).

[9] Ederington (2003) shows that the "non-neutrality" of cross-retaliation may result from the imperfect monitoring on deviations: cross-retaliation may be beneficial (is detrimental) when there is the possibility that a country fails to detect (erroneously believes) its trading partner's deviation with domestic policy. The on-schedule linkage in this paper, however, intends to elicit countries' truthfulness rather than a stronger threat as in his paper.

be the natural import good of the home (foreign) country. Each of the two goods is demanded in both countries according to a symmetric demand function D. Let p_i^d and p_i^s denote the local prices of good $i=x,y$ in the domestic market. To obtain some concrete insights in later analysis, this paper assumes that the demand and supply functions take specific linear forms: $D(p_i^d)=\alpha-\beta p_i^d$ for $i=x,y$, $Q_x(p_x^s)=\gamma p_x^s$, and $Q_y(p_y^s)=\phi p_y^s$. The foreign demand and supply functions are symmetrically specified: $D(p_i^{*d})=\alpha-\beta p_i^{*d}$ for $i=x,y$, $Q_x^*(p_x^{*s})=\phi p_x^{*s}$ and $Q_y^*(p_y^{*s})=\gamma p_s^{*s}$. The associated parameters α, β, γ and ϕ are strictly positive. Consistent with the assumption that the domestic country is the natural importer of good x, it is assumed that $Q_x(p)=Q_y^*(p)<Q_y(p)=Q_x^*(p)$; i.e., $\gamma<\phi$.

This paper introduces domestic tax (subsidy) into the model by assuming that each country incurs an external cost (benefit) when it produces the import good. This paper also assumes that policy choices are publicly observed, whereas external costs (benefits) are privately observed by the associated government; thus, it is non-verifiable whether a reduction of domestic tax (increase of subsidy) is intended to internalize external impacts, or to offer additional protection to the import good. Following Ederington (2002), this paper assumes that external impacts take linear forms: $\theta Q_x(p_x^s)$ and $\theta^* Q_y^*(p_y^{*s})$. In each period, the marginal impacts, θ and θ^*, are independently drawn from the identical common-knowledge distribution with discrete support $\{\theta_L, \theta_H\}$, where $\theta_L<\theta_H$ and probability of θ_j is μ_j, $j\in\{L,H\}$. Each of θ and θ^* thus acts as a country's privately-observed "type".

Let t and τ denote, respectively, the (specific) production tax and the tariff that the home country imposes on good x. Let t^* and τ^* denote the analogous policies that the foreign country imposes on good y. Suppose also that p_x^w and p_y^w denote the world (offshore) prices of goods x and y. The domestic consumer and producer prices of import good x are defined as $p_x^d\equiv p_x^w+\tau$, $p_x^s\equiv p_x^w-t+\tau$, where $p_x^w=p_x^{*d}=p_x^{*s}$. Likewise, the foreign consumer and producer prices of import good y are defined as $p_y^{*d}\equiv p_y^w+\tau^*$, $p_y^{*s}\equiv p_y^w-t^*+\tau^*$, where $p_y^w=p_y^d=p_y^s$. If the trade and domestic policies do not prohibit all trade, then world and local prices must satisfy the market-clearing condition:

$$Q_i(p_i^s)+Q_i^*(p_i^{*s})=D(p_i^d)+d(p_i^{*d}),\qquad i=x,y. \tag{1}$$

The market-clearing world prices are then

$$p_x^w(t,\tau)=\frac{2\alpha+\gamma t-(\beta+\gamma)\tau}{\phi+\gamma+2\beta}\ \text{and}\ p_y^w(t^*,\tau^*)=\frac{2\alpha+\gamma t^*-(\beta+\gamma)\tau^*}{\phi+\gamma+2\beta}.$$

The market-clearing local prices of import goods, $\hat{p}_x^d$, $\hat{p}_x^s$, $\hat{p}_y^{*d}$ and $\hat{p}_y^{*s}$ are similarly obtained. Note that each government can reduce the world price of its import good by raising the tariff or reducing the domestic tax. To deal with the parameter range in which (i) trade volumes are non-negative under Nash policies and (ii) each country produces the import-competing good under free trade, it is assumed that θ is in the range:

$$-\frac{\alpha(\phi-\gamma)}{\gamma(\phi+\beta)}\le\theta<\min\left\{\frac{\phi+2\gamma+3\beta}{\gamma}-\frac{\alpha(\phi-\gamma)}{\gamma(\phi+\beta)},\frac{2\alpha}{\phi+2\beta}\right\}$$

Trade occurs as long as the positive externality in the import-competing industry is not too large. The import good is produced as long as the negative externality is not too large.

Define next domestic consumer and producer surpluses as $\mathrm{CS}_i(\hat{p}_i^d)\equiv\int_{\hat{p}_i^d}^{\alpha/\beta}D(p_i)dp_i$ and $\Pi_i(\hat{p}_i^s)\equiv\int_0^{\hat{p}_i^s}Q_i(p_i)dp_i$ for $i=x,y$. Define also $\hat{p}_x\equiv(\hat{p}_x^d,\hat{p}_x^s)$ and $\hat{p}_y^*\equiv(\hat{p}_y^{*d},\hat{p}_x^{*s})$ This section

describes the interim-stage game where the domestic government observes $\theta=\theta_j$, and the foreign government observes $\theta^*=\theta_k$. Given that the associated policy choices are ($t=t_j$, $\tau=\tau_j$) and ($t^*=t_k$, $\tau^*=\tau_k$), the domestic country's welfare from good x and good y is

$$W_x(\hat{p}_x, p_x^w) \equiv \mathrm{CS}_x(\hat{p}_x^d) + \Pi_x(\hat{p}_x^s) + [\hat{p}_x^d - \hat{p}_x^w] M_x(\hat{p}_x) + [\hat{p}_x^d - \hat{p}_x^s - \theta_j] Q_x(\hat{p}_x^s);$$

$$W_y(p_y^w) \equiv \mathrm{CS}_y(p_x^w) + \Pi_y(p_y^w),$$

where $\hat{p}_x=\hat{p}_x(t=t_j,\ \tau=\tau_j)$, $p_x^w=p_x^w(t=t_j,\ \tau=\tau_j)$, and $p_y^w=p_y^w(t^*=t_k,\ \tau^*=\tau_k)$. Thus the interim-stage welfare function is

$$W(\hat{p}_x, p_x^w, p_y^w) \equiv W_x(\hat{p}_x, p_x^w) + \sum_{k\in\{L,H\}} \mu_k W_y(p_y^w), \tag{2}$$

where probability is weighted over good y since p_y^w is unknown and conditional on the trading partner's type. Likewise, the foreign government has the interim-stage welfare function $W^*(\hat{p}_x^*, p_x^w, p_y^w)$.

"Nash policies" of the domestic country (denoted by τ_j^N and t_j^N) satisfy the first-order conditions of Eq. (2) with respect to τ and t: for $j\in\{L,H\}$,

$$(\beta+\gamma) M_x(\hat{p}_x) - (\beta+\phi)(\beta+\gamma)\tau_j + \gamma(\beta+\phi)(t_j-\theta_j) = 0; \tag{3}$$

$$-\gamma M_x(\hat{p}_x) + \gamma(\beta+\phi)\tau_j - \gamma(2\beta+\phi)(t_j-\theta_j) = 0. \tag{4}$$

Nash policies for the foreign country are similarly obtained.[10] The first term on the LHS of Eq. (3) (multiplied by $1/(\phi+\gamma+2\beta)$) corresponds to $W_{p_x^w}(\partial p_x^w/\partial\tau)$. It captures the change in the welfare of the domestic government caused by the impact of a slight increase of tariff on the world price, with the local prices being held constant. This is the terms-of-trade effect, which reflects a redistribution of surplus from foreign exporters to the domestic country. A slight rise in the import tariff increases the tariff revenue collected on $M_x(\hat{p}_x)$ units of import good as a result of lowering the world price.[11] In Nash policies, governments unilaterally raise tariffs to achieve terms-of-trade effects, with no domestic distortions.

In the first-best policies, however, no country manipulates terms of trade. With local prices being held constant, a change in world prices results in a simple redistribution of income across countries. Indeed, the first-best policies are obtained by eliminating the terms for terms-of-trade effect in Eqs. (3) and (4).[12] Our analysis thus obtains a standard result in the context of a private information model.

[10] Note that the second-order conditions are satisfied: $d^2W(\cdot)$ is negative definite.

[11] When multiplied by $1/(\phi+\gamma+2\beta)$, the second term is $\tau(\partial M_x/\partial\tau)$ that captures the efficiency cost incurred when a tariff increase induces the import reduction, while the third term is $(t_j-\theta_j)Q_x'(\hat{p}_x^s)(\partial\hat{p}_x^s/\partial\tau)$ that captures the net effect on tax revenue and external cost when a tariff increase raises the producer price. Eq. (4) is similarly interpreted.

[12] It can be shown that the second-order condition is satisfied.

Proposition 1. *Suppose that a country observes θ_j, $j \in \{L,H\}$. (i) There exists a unique Bayesian–Nash equilibrium in which*

$$t_j = \theta_j \text{ and } \tau_j = \frac{\alpha(\phi - \gamma) + \gamma(\beta + \phi)\theta_j}{(\beta + \phi)(\phi + 2\gamma + 3\beta)}.$$

(ii) The first-best policy choices are $t_j = \theta_j$ and $\tau_j = 0$.

3. Repeated games with incentive to undertax

In the stage game, each government learns only its own type and then chooses domestic tax and tariff. The per-period state space is $\Omega \equiv \Theta \times \Theta^*$, where $\Theta = \{\theta_L, \theta_H\}$ and $\Theta^* = \{\theta_L, \theta_H\}$. The symmetric strategy sets in the stage game are $S = \{t | t : \Theta \to R\} \times \{\tau | \tau : \Theta \to R\}$ and $S^* = \{t^* | t^* : \Theta^* \to R\} \times \{\tau^* | \tau^* : \Theta^* \to R\}$. The domestic country's stage-game payoff is $W : S \times S^* \to R$, and its expected stage-game payoff is $\bar{W}(s) = E_{\tilde{\theta}}[W(s(\theta), s^*(\theta^*); \theta)]$, where $s = (s, s^*)$ and $\tilde{\theta} \equiv (\theta, \theta^*)$.[13] This stage game is infinitely repeated. Entering a period, each government publicly observes the history of realized policy choices but privately observes the history of its own type and the associated policy functions. Attention here is restricted to Perfect Public Equilibrium, where governments' choices at date n may be based on private information from date n, but only on public information (realized policy choices) from date $n' < n$ (Fudenberg et al., 1994).

To be implementable as an equilibrium play, the policy choices must satisfy (i) the on-schedule constraints that each government truthfully choose the policies assigned to its type and (ii) the offschedule constraints that each government cannot gain by choosing a policy mix that is not assigned to any cost type. Our analysis hereafter is based on the following assumptions: (i) any off-schedule deviation by a country leads to infinite Nash reversion, and (ii) governments do not use any form of direct monetary payments: side-payments, and negative tariffs or export policies as a channel of direct monetary payments. State $(\theta_j, \theta_k) \in \Omega$ is indexed as (j, k). Welfare functions are now written in terms of policy choices: in state (j, k), the domestic government achieves $W_x(t = t_j, \tau = \tau_j; \theta_j)$ from import good x and $W_y(t^* = t_k, \tau^* = \tau_k)$ from export good y, and the foreign government attains $W_y^*(t^* = t_k, \tau^* = \tau_k; \theta_k)$ from import good y and $W_x^*(t = t_j, \tau = \tau_j)$ from export good x.

In the model, the efficiency that is enhanced by tariff reduction can be subsequently eroded by protection in the form of domestic policies. A unilateral reduction of domestic tax decreases the world price. At the same time, it increases the domestic producer price and decreases the domestic consumer price. This causes a redistribution of surplus from foreign exporters to its domestic consumers and producers, with some implied efficiency costs. If the domestic government, observing θ_H, sets its tax at θ_L under free trade, then it gains

$$\begin{aligned} &W_x(t = \theta_L, \tau = 0; \theta_H) - W_x(t = \theta_H, \tau = 0; \theta_H) \\ &\quad = \int_{\hat{p}_x^d(t=\theta_H, \tau=0)}^{\hat{p}_x^d(t=\theta_L, \tau=0)} D(p_x)dp_x + \int_{\hat{p}_x^s(t=\theta_H, \tau=0)}^{\hat{p}_x^s(t=\theta_L, \tau=0)} Q_x(p_x)dp_x - (\theta_H - \theta_L)Q_x(t = \theta_L, \tau = 0). \end{aligned} \tag{5}$$

[13] The expected stage-game payoff for the foreign country is analogous.

As the level of θ_L decreases for a given θ_H, the first two terms in Eq. (5) dominate at the beginning, but later the last term for the efficiency costs dominates. Thus, for a given θ_H, there exists a lower bound of θ_L (denoted by ℓ_L):

$$\ell_L = \ell_L(\theta_H) \equiv \frac{(\beta + (\phi + 2\beta)^2)\theta_H}{\eta} - \frac{2\alpha(\phi - \gamma)}{\gamma\eta},$$

where $\eta \equiv (\beta+\phi)+(\phi+2\beta)\,(1+\phi+2\beta)$. The locus $\ell_L=\ell_L(\theta_H)$ is seen in Fig. 1. Area ABC is defined as $UT \equiv \{(\theta_H,\theta_L):\theta_L<\ell_L(\theta_H)\}$, and area ADC is defined as $FB \equiv \{(\theta_H,\theta_L):\theta_L \le \ell_L(\theta_H)\}$. In area UT, the first-best policy choices are not incentive compatible. In area FB, sufficiently patient governments can attain the first-best welfare. This paper hereafter restricts attention to parameter area UT.

Assumption 1. $W_x(t=\theta_L,\ \tau=0;\theta_H) - W_x(t=\theta_H,\tau=0;\theta_H) > 0.$

4. Non-optimalities of uniform tariff reductions

The main findings are presented here and in the next section. In this section, we find that a uniform tariff reduction is not desirable if it induces the high-cost government to use disguised protection in the form of domestic policies.

Lemma 1. *Given a government's policy mix $((t_L,\ \tau_L),(t_H,\ \tau_H))$, where $t_H<\theta_H$ and $\tau_L=\tau_H=0$, (i) there exists a policy mix $((t_L,\tau_L),\ (t'_H\equiv\theta_H,\tau'_H))$, under which the government is better off while its trading partner is indifferent, and (ii) there exists another policy mix $((t_L,\ \tau_L),\ (t''_H\equiv\theta_H,\ \tau''_H))$, under which the government is indifferent while its trading partner is better off.*

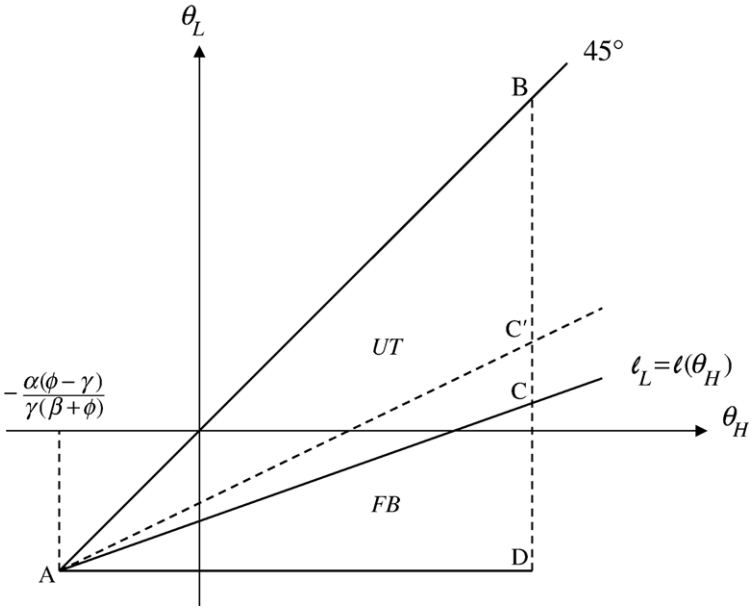

Fig. 1. Areas of UT and FB.

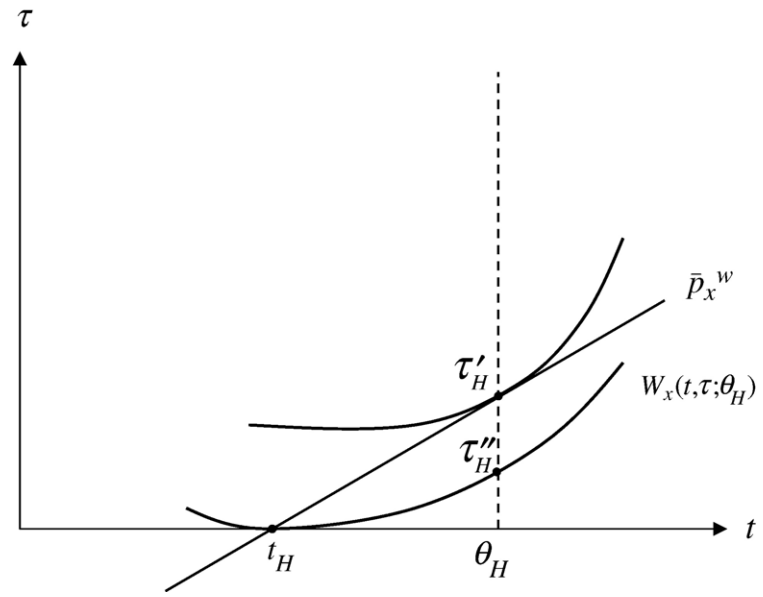

Fig. 2. Alternative policies.

The proof is in the Appendix. The alternative policy mixes (t'_H, τ'_H) and (t''_H, τ''_H) are illustrated in Fig. 2, wherein the world price is held constant along the line $\bar{p}_x^w$. The initial policy pair causes a domestic distortion under free trade. If the high-cost government can choose any policy mix, as long as the world price is unaffected (the trading partner's welfare is unaffected), then it will achieve the terms-of-trade effects by raising the tariff ($\tau'_H > 0$), with no domestic distortion. If the high-cost (home) government is better off switching its policy mix to (t'_H, τ'_H), then there exists a lower tariff $\tau''_H < \tau'_H$ such that for (t''_H, τ''_H), the home government is indifferent and the foreign government is better off. Assuming the same notation, we extend the second result in Lemma 1.

Lemma 2. *Assume that both governments are assigned to the same policy mix. If the initial free-trade policy mix in* Lemma 1*, $((t_L,\tau_L), (t_H,\tau_H))$, is incentive compatible, then the alternative policy mix $((t_L,\tau_L), (t''_H,\tau''_H))$ is also incentive compatible.*

A sketch of the proof. Incentive compatibility of the initial policy mix $((t_L, 0), (t_H, 0))$ implies that

$$W_x(t = t_L, \tau = 0;\ \theta_L) \geq W_x(t = t_H,\ \tau = 0;\ \theta_H) \qquad (\text{on} - \text{IC}_{\text{L}}^0)$$

$$W_x(t = t_H, \tau = 0; \theta_H) \geq W_x(t = t_L, \tau = 0; \theta_H) \qquad (\text{on} - \text{IC}_{\text{H}}^0)$$

and that for the common discount factor δ,

$$\frac{\delta}{1-\delta}\left(\bar{W}^0 - \bar{W}^N\right) \geq \max\{\Delta_L, \Delta_H\}, \qquad (\text{off} - \text{IC}^0)$$

where $\bar{W}^0$ and $\bar{W}^N$ denote the per-period expected welfare under the initial and Nash policies, and where

$$\Delta_j \equiv W_x(t = \theta_j, \tau = \tau_j^N; \theta_j) - W_x(t = t_j, \tau = 0;\ \theta_j),\ j = L, H.$$

The RHS of off-IC^0 represents the immediate gain from an off-schedule deviation, and the LHS represents the long-term loss that follows the deviation. Letting δ^0 be the critical discount factor above which off-IC^0 is satisfied, the home government is sufficiently patient such that $\delta > \delta^0$.

It now suffices to show that the alternative policy mix $((t_L, 0), (\theta_H, \tau_H''))$ satisfies both on-and off-schedule constraints, for all $\delta > \delta^0$. The associated on-schedule constraints are

$$W_x(t = t_L, \tau = 0; \theta_L) \geq W_x(t = \theta_H, \tau = \tau_H''; \theta_L); \qquad (\text{on} - \text{IC}_{\text{L}}'')$$

$$W_x(t = \theta_H, \tau = \tau_H''; \theta_H) \geq W_x(t = t_L, \tau = 0; \theta_H). \qquad (\text{on} - \text{IC}_{\text{H}}'')$$

The second constraint is immediate: the high-cost government is indifferent between (θ_H, τ_H'') and $(t_H, 0)$ from Lemma 1, and prefers $(t_H, 0)$ to $(t_L, 0)$ from on-IC$^0_{\text{H}}$. The first constraint is slack, due to the single crossing property: the low-cost government needs a higher τ for a given rise in t so as to be indifferent, since it suffers a higher efficiency cost than the high-cost government.[14] Thus, when the high-cost government is indifferent between $(t_H, 0)$ and (θ_H, τ_H''), the low-cost government prefers $(t_H, 0)$ to (θ_H, τ_H''):

$$W_x(t = t_L, \tau = 0; \theta_L) \geq W_x(t = t_H, \tau = 0; \theta_L) > W_x(t = \theta_H, \tau = \tau_H''; \theta_L),$$

where the first inequality is on-IC$^0_{\text{L}}$. The off-schedule constraint under the alternative policy mix is

$$\frac{\delta}{1-\delta}\left(\bar{W}'' - \bar{W}^N\right) \geq \max\{\Delta_L, \Delta_H''\}, \qquad (\text{off} - \text{IC}'')$$

where $\bar{W}''$ denotes the per-period welfare of the home government, and where

$$\Delta_H'' \equiv W_x(t = \theta_H, \tau = \tau_H^N; \theta_H) - W_x(t = \theta_H, \tau = \tau_H''; \theta_H).$$

The second result of Lemma 1 implies that if the foreign government is assigned to $((t_L, \tau_L), (\theta_H, \tau_H''))$, the home government is better off: $\bar{W}'' > \bar{W}^0$. As compared to off-IC^0, the RHS of off-IC$''$ is the same, but the LHS is greater. Hence, the alternative policy mix satisfies both on-and off-schedule constraints for all $\delta > \delta^0 > \delta''$. □

We next build on Lemma 1 and 2 to establish some non-optimal agreements. This paper says that an agreement is not optimal if it is always improved upon by another incentive-compatible agreement.

Consider first an agreement on the optimal pooling policies: $t_L = t_H = E(\theta)$ and $\tau_L = \tau_H = 0$.[15] This agreement is easy to enforce since any deviation would be duly detected. The pooling policies are not optimal since the high-cost government there distorts domestic policies. By the same token, separating domestic policies ($t_L \neq t_H$) along with free trade are not optimal when the high-cost government distorts domestic policies.

Lemma 3. *Free trade under which the high-cost government distorts its domestic policy is not optimal.*

The proof for Lemma 3 is immediate: for free trade to be incentive compatible, domestic policies must be either pooling or separating, but neither pooling nor separating of domestic

[14] The proof for this part is detailed in the Appendix.

[15] Pooling at $E(\theta)$ minimizes the expected efficiency cost under free trade, when the externality enters linearly in the welfare functions.

policies is optimal when $t_H \neq \theta_H$.[16] Indeed, this result holds for all sufficiently low tariffs at which the high-cost government is motivated to undertax its import good.

Proposition 2. *If a trade agreement motivates the high-cost government to use domestic policies as disguised protection, then the agreement will always be improved upon by another incentive-compatible agreement that eliminates the high-cost government's disguised protection by permitting it to raise its tariff.*

It becomes clear that the high-cost government never uses domestic policies as disguised protection in an optimal agreement (i.e., $t_H = \theta_H$ in an optimal agreement). This finding broadly implies that trade agreements should include cooperation over domestic policies, so as to reduce the inefficiency that would otherwise persist due to subsequent disguised protections. It also implies that free trade (or a uniform tariff reduction) may be optimal only if the agreement on free trade assigns the low-cost government to a sufficiently low t_L so that the high-cost government has no incentive to distort its domestic policy. Free trade is thus achieved only at the expense of domestic distortions in the low-cost country ($t_L < \theta_L$), which may be too high. The following result shows that free trade may be optimal only in quite a limited parameter range.

Corollary 1. *(i) Free trade is optimal if and only if free trade with $t_L = \ell_L$ and $t_H = \theta_H$ is optimal. (ii) There exists a range of the gap $\theta_H - \theta_L$ in which free trade is not optimal; $\tau_H > 0$ in an optimal agreement.*

The first result follows directly from the previous analysis. Free trade is optimal if and only if free trade along with $t_H = \theta_H$ is optimal. The high-cost government is induced to choose $t_H = \theta_H$ only when $t_L \leq \ell_L$. The second result shows that domestic inefficiency in the low-cost country becomes too large when the gap $\theta_L - \ell_L$ is sufficiently large ($\theta_H - \theta_L$ is sufficiently small). The range of $\theta_H - \theta_L$ in which this occurs is illustrated by area ABC′ in Fig. 1.

5. Optimalities of conditional tariff schedules

This section investigates when domestic distortions are never used as protective measures in an optimal agreement. Put differently, it asks when the targeting principle, in the sense of Bhagwati and Ramaswami (1963) and Johnson (1965), holds in the presence of private information. To this end, suppose that (t_j, τ_j) and (t_k, τ_k) are agreed on in state (j, k). The ex post joint welfare, realized in state (j, k), is then

$$\omega_{jk} \equiv W_x(t = t_j, \tau = \tau_j; \theta_j) + W_y(t^* = t_k, \tau^* = \tau_k) + W_x^*(t = t_j, \tau = \tau_j) + W_y^*(t^* = t_k, \tau^* = \tau_k; \theta_k),$$

and the ex ante expected joint welfare is

$$\bar{\omega} \equiv \sum_{j \in \{L,H\}} \sum_{k \in \{L,H\}} \mu_j \mu_k \omega_{jk}.$$

Due to the symmetry of the model, it can be shown that $\omega_{LH} + \omega_{HL} = \omega_{LL} + \omega_{HH}$. This reduces the expected joint welfare to $\bar{\omega} = \mu_L \omega_{LL} + \mu_H \omega_{HH}$.

To simplify the exposition, assume that governments are sufficiently patient. Note, first, that a policy mix optimally achieves domestic efficiencies if $(t_L, \tau_L) = (\theta_L, 0)$ and $(t_H, \tau_H) = (\theta_H, \hat{\tau}_H)$,

[16] If $t_H > \theta_H$ under free trade, then both high- and low-cost governments can always reduce domestic distortions by setting $t_H = \theta_H$.

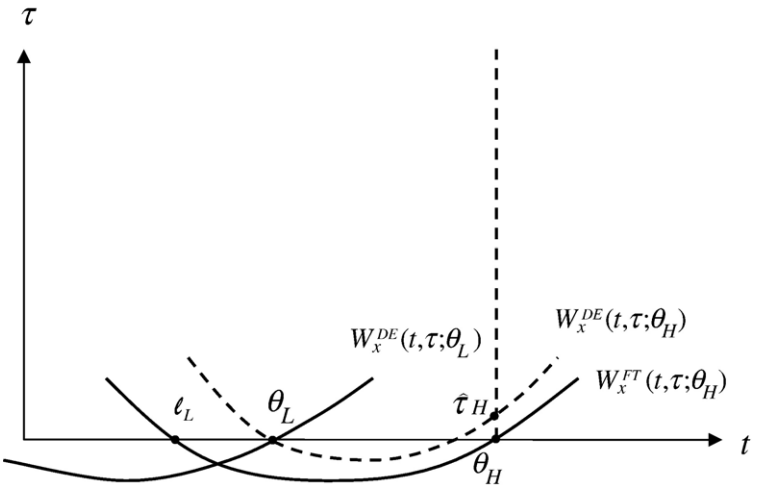

Fig. 3. Free trade and DE policies.

where a positive tariff $\hat{\tau}_H>0$ is defined such that on-IC$_H$ is binding: $W_x(t=\theta_H,\tau=\hat{\tau}_H;\ \theta_H)=W_x(t=\theta_L,\ \tau=0;\ \theta_H)$. This policy mix is denoted as DE policies and illustrated in Fig. 3.[17] Note, second, that $\tau_L=0$ in an optimal agreement: setting $\tau_L>0$ induces the high-cost government to be more tempted to mimic a low-cost country, and thus increases inefficiencies not only in (L, L) but also in (H, H). Note, third, that $t_H=\theta_H$ in an optimal agreement by Proposition 2.

Therefore, the design of optimal policy agreement faces a trade-off between domestic efficiency in the low-cost country and tariff efficiency in the high-cost country. DE policies achieve domestic efficiency in the low-cost country but allow tariff inefficiency in the high-cost country. Any alternative to DE policies allows domestic inefficiency in the low-cost country, but with a reduced tariff in the high-cost country. A typical alternative is the optimal free trade with $t_L=\ell_L$ and $t_H=\theta_H$. Here again, the targeting principle is exploited: given the issue of terms-of-trade externality, only the efficient instrument (trade policy) is used in DE policies, whereas the inefficient instrument (domestic policy) also is used in alternative policies. Ignoring the probability weights, this argument obtains

$$\omega_{LL}^{\mathrm{DE}}+\omega_{HH}^{\mathrm{DE}}>\omega'_{LL}+\omega'_{HH}.$$

The values $\omega_{jj}^{\mathrm{DE}}$ and ω'_{jj} are the ex post joint welfare attained from DE policies and any alternative policies (t'_j,τ'_j), $j\in\{L,H\}$. Each of the values varies with the gap $\theta_H-\theta_L$ and other parameters, but the inequality remains.[18] To compare DE policies to any alternative, define the ratio of the welfare gain in (L, L) to the welfare loss in (H, H) as follows:

$$\kappa'\equiv\frac{\omega_{LL}^{\mathrm{DE}}-\omega'_{LL}}{\omega'_{HH}-\omega_{HH}^{\mathrm{DE}}}>1.$$

[17] In Fig. 3, $W_x^{\mathrm{DE}}(t,\tau;\theta_H)$ is asymmetrically shifted up from $W_x^{\mathrm{FT}}(t,\tau;\theta_H)$. The intuition for this is that under free trade, a reduction (rise) in t has a terms-of-trade gain (loss), and thus the rise in t (from ℓ_L) must be greater than the reduction in t (from θ_H), so as to stay in the same welfare by reducing the domestic inefficiency.

[18] This inequality is reinforced by the asymmetric shifting up of $W_x^{\mathrm{DE}}(t,\tau;\theta_H)$.

The analysis of comparing two policy agreements is simply that $\bar{\omega}^{DE} > \bar{\omega}'$ if and only if $\mu_L > 1/(\kappa' + 1)$.

Proposition 3. *(i) If governments are sufficiently patient and if there is a policy mix* (t'_j, τ'_j), $j \in \{L, H\}$, *such that* $\mu_L \leq 1/(\kappa' + 1) < 1/2$, *then there are domestic distortions in an optimal agreement:* $t_L \neq \theta_L$ *and* $t_H = \theta_H$. *(ii) Otherwise, there is no domestic distortion in an optimal agreement:* $t_L = \theta_L$ *and* $t_H = \theta_H$ *together with* $\tau_H > 0$.

The second part of Proposition 3 holds for all δ. That is because when δ is low enough, domestic efficiencies are achieved in Nash policies. Some domestic distortions in the low-country may be allowed to accommodate a tariff reduction in the high-cost country only if the probability of such domestic distortions being realized is sufficiently low: domestic distortions are never commonly realized in an optimal agreement, since governments could otherwise be better off eliminating domestic distortions with positive tariffs in the high-cost country. There are two broad policy implications in this finding. First, if domestic distortions are frequently realized perhaps by countries that face strong import competition, it might be more desirable to permit tariff schedules to be conditional on domestic policies than to induce frequent disguised protections such as lax environmental standards under uniform tariff reductions. Second, to this end, WTO rules need a modification so that tariffs can be conditional on domestic policies. Under current WTO rules, a country that truthfully raises its domestic tax or environmental standard would not be allowed to raise its tariff.

Along with Corollary 1, this finding also implies that free trade is optimal only under rather limited conditions: the gap $\theta_H - \theta_L$ is sufficiently large ($\ell_L - \theta_L$ is sufficiently small) and μ_L is sufficiently small such that $\mu_L < 1/(\kappa^{FT} + 1)$, where $\kappa^{FT} \equiv (\omega'_{LL} - \omega^{FT}_{LL})/(\omega^{FT}_{HH} - \omega'_{HH})$ and when ω'_{jj} is attained from the best non-free trade policies whereas ω^{FT}_{jj} is attained under free trade.

This section lastly argues that the non-optimality of free trade that holds in a wide range of parameters is in support of the on-schedule policy linkage that permits tariffs to be conditional on domestic policies. If free trade (where tariffs are uniformly zero) is optimal, the on-schedule linkage is welfare-neutral. If free trade is not optimal, however, it is welfare-improving. When free trade is not optimal, then $\tau_L = 0$ and $\tau_H > 0$ in an optimal agreement for high δ, and $\tau_H > \tau_L > 0$ in Nash policies for low δ; thus, tariffs are conditional on domestic policies in an optimal agreement for all δ.

Proposition 4. *(i) If governments are sufficiently patient and if free trade is optimal, then it is welfare-neutral to permit tariffs to be conditional on domestic policies. (ii) Otherwise, it is welfare-improving to permit tariffs to be conditional on domestic policies.*

6. Some extensions

This section discusses three possibilities of extending the model.[19] The first possibility of extension is a continuous-type model in which θ is drawn from the support $[\underline{\theta}, \bar{\theta}]$ according to the commonly known distribution function $F(\theta)$. The associated policy schedules for each type θ are denoted $(t(\theta), \tau(\theta))$ and $(t^*(\theta), \tau^*(\theta))$. The first-best policies, $t(\theta) = t^*(\theta) = \theta$ and $\tau(\theta) = \tau^*(\theta) = 0$ for all θ, are never incentive compatible, since governments above $\underline{\theta}$ can always make a tax reduction without triggering a punishment under the policies.[20]

[19] The first two extensions seen in this section are motivated by the referees' reports.

[20] In the continuous-type model, governments under the first-best policies can make a slight tax reduction to disguise their cheating. In the two-type model, however, the high-cost government under the first-best policies must make a substantial tax reduction to disguise its cheating; the government thus has an incentive to undertax only when θ_L is not too far away from θ_H as in Assumption 1.

Suppose that governments are sufficiently patient. Using a similar logic as above, we can show that $t(\overline{\theta})=t^*(\overline{\theta})=\overline{\theta}$ in an optimal agreement. Assume to the contrary that the domestic government at its highest cost $\overline{\theta}$ is assigned to an incentive-compatible policy mix $(t(\overline{\theta}), \tau(\overline{\theta}))$, where $t(\overline{\theta})<\overline{\theta}$. Then consider a tariff schedule $\tau=\tau(\overline{\theta})+[\gamma/(\beta+\gamma)][t-t(\overline{\theta})]$ that increases with t and maintains the world price p_x^w along the associated policy-mix line segment. The government at the highest cost $\overline{\theta}$ prefers to choose policies from the policy-mix line segment than to stay with $(t(\overline{\theta}), \tau(\overline{\theta}))$. In fact, there exists a range $[\overline{\theta}-c, \overline{\theta}]$ for $c>0$ such that the government in the range prefers to choose policies from the line segment than to stay with the initial policies. [21] Thus, the government can increase its expected welfare without damaging its trading partner's welfare, which is a contradiction. Hence, $t(\overline{\theta})=\overline{\theta}$ in an optimal agreement.

This result implies that free trade at the best pooling, $(t(\theta), \tau(\theta))=(E(\theta), 0)$ for all θ, is not optimal since $t(\overline{\theta})=E(\theta)<\overline{\theta}$. Free trade is optimal only if free trade along with $t(\overline{\theta})=\overline{\theta}$ is optimal. Let $\underline{\ell}$ denote the lower bound of the tax levels that the type-$\overline{\theta}$ government under $(t(\overline{\theta}), \tau(\overline{\theta}))=(\overline{\theta}, 0)$ has an incentive to choose. The notation $\underline{\ell}$ corresponds to ℓ_L in the two-type model. The type-$\overline{\theta}$ government is induced to choose $t(\overline{\theta})=\overline{\theta}$ under free trade only when $t(\tilde{\theta})\leq\underline{\ell}$ for all $\tilde{\theta}<\overline{\theta}$. Therefore, free trade (a uniform tariff reduction) is achieved only at the substantial expense of domestic distortions below $\overline{\theta}$, which may be too high.[22] The counterpart of free trade would be the conditional tariff schedule $\tau=[\gamma/(\beta+\gamma)][t-\underline{\theta}]$ that eliminates domestic distortions for all types. This policy schedule also has a weakness: it allows positive tariffs for all types regardless of the shape of the distribution function F. The model thus poses various possibilities of allowing domestic distortions. Domestic distortions are, however, never commonly realized below a certain level of tax $\tilde{t}$ in an optimal agreement, since governments could otherwise be better off adopting a conditional tariff schedule for some types located between $\tilde{t}$ and $\overline{\theta}$.

The second possibility of extension is a lobbying model that accommodates a political-economy externality by placing a weight on producer surplus. An important assumption is that domestic political pressure changes over time for various political reasons and only the domestic government knows the weight. Let $\lambda_x\geq 1$ $(\lambda_y\geq 1)$ denote the weight that the government places on the producer surplus earned by import-competing (exporting) firms. Ignoring the state-dependent subscripts seen in the previous model, the first-order conditions for the government with respect to τ and t are

$$(\beta+\gamma)M_x(\hat{p}_x)-(\beta+\phi)(\beta+\gamma)\tau+\gamma(\beta+\phi)(t-\theta)+(\lambda_x-1)(\beta+\phi)Q_x(\hat{p}_x^s)=0;$$

$$-\gamma M_x(\hat{p}_x)+\gamma(\beta+\phi)\tau-\gamma(2\beta+\phi)(t-\theta)-(\lambda_x-1)(2\beta+\phi)Q_x(\hat{p}_x^s)=0.$$

The last term in each equation is new and captures a political-economy effect.[23] Trade volumes are positive for positive Nash tariffs and the import-competing goods are produced under zero tariffs if

$$\lambda_x<2+\min\left\{\frac{\gamma}{2\beta+\phi}, \frac{\gamma[\theta(\beta+\phi)-\alpha]}{\alpha\phi}\right\} \text{ and } \theta<\frac{2\alpha}{2\beta+\phi}.$$

[21] Note that for the government at the highest cost $\overline{\theta}$, the initial policy mix $(t(\overline{\theta}), \tau(\overline{\theta}))$ was at least as preferable as any other initial policy mix. For the government in the range $[\overline{\theta}-c,\overline{\theta})$, its initial policy mix was at least as preferable as $(t(\theta), \tau(\theta))$.

[22] Free trade may be optimal with a very stringent assumption that the distribution function F has a mass point at $\overline{\theta}$ such that types below $\overline{\theta}$ are rarely realized.

[23] The last terms represent the impact of a slight policy change on the producer surplus that has an extra political weight.

Given this parameter range and the multiple sources of private information, Bayesian–Nash policy choices for the home country, $t^N(\theta,\lambda_x)$ and $\tau^N(\theta,\lambda_x)$, satisfy

$$t = \theta-(\lambda_x-1)\frac{Q_x(\hat{p}_x^s)}{\gamma} \text{ and } \tau = \frac{M_x(\hat{p}_x)}{\beta+\phi}.$$

To show that the government has an incentive to undertax subsequent to a tariff reduction, let $t^{\mathrm{PE}}(\theta,\lambda_x;\tau)$ denote the "political-economy tax" that satisfies the first equation for a given τ.[24]

Lemma 4. *(i) $t^{PE}(\theta,\lambda_x;\tau)$ increases with θ and decreases with λ_x. (ii) The domestic welfare function has the slope $d\tau/dt=\gamma/(\beta+\gamma)$ at a point (t, τ) if and only if $t=t^{PE}(\theta,\lambda_x;\tau)$.*

The proof is in the Appendix. The first result implies that when tariffs are uniformly zero, the political-economy tax $t^{\mathrm{PE}}(\theta,\lambda_x;\tau=0)$ is lower when production externality is lower or when political pressure is higher. The second result has two implications. First, the government under free trade can achieve terms-of-trade gains and increase its welfare by lowering its domestic tax below $t^{\mathrm{PE}}(\theta,\lambda_x;\tau=0)$.[25] Second, if the government is induced to choose any policy mix (t, τ) along a line segment that has the slope $d\tau/dt=\gamma/(\beta+\gamma)$, then it will truthfully choose $t=t^{\mathrm{PE}}(\theta,\lambda_x;\tau)$ without affecting its trading partner's welfare. Our main finding can be summarized as follows. Assume that domestic political pressure is rather unstable over time and arbitrarily *overstated* and that tax reductions below $t^{\mathrm{PE}}(\theta,\lambda_x;\tau)$ are commonly observed subsequent to a tariff-reduction agreement. Then it might be more preferable to adopt a conditional tariff schedule than to induce frequent disguised protections under a uniform tariff reduction.

The third possibility of extension is a sophisticated modification in which tariff schedules are conditional on "intertemporal scorekeeping." In this agreement, if the high-cost government truthfully chooses a high tax, then it receives a future reward when its trading partner sets a low tax.[26] This future reward will be realized when the high-cost government is permitted to raise its tariff to $\hat{\tau}$ tomorrow. If it lies and chooses a low tax, then it suffers a future loss (on-schedule punishment) when its trading partner sets a high tax. This future loss will be realized when its trading partner is permitted to raise its tariff to $\hat{\tau}$ tomorrow. The level of $\hat{\tau}$ is determined such that the expected (discounted) sum of future reward and future loss is greater than the high-cost governments' gain from undertaxing in the current period. For a given $\hat{\tau}$, the associated future punishment is greater than the future reward since a tariff increase by the home government suffers from some inefficiency (welfare loss).

If μ_H is high, then a truthful high-cost government will receive the future gain with a small probability of its trading partner drawing low cost, but an untruthful high-cost government will suffer a "large" future punishment with a high probability of its trading partner drawing high cost. Indeed, if positive tariffs are ever used to achieve incentive compatibility and if μ_H is high enough, then sufficiently patient governments prefer to condition tariffs on the preceding-period states than on current-period states.[27] If μ_H is high,

[24] Given the parameter range, the second-order conditions are satisfied. In Nash policies, the domestic government uses higher protective measures (lower t^N and higher τ^N) when the political weight λ_x is larger.

[25] Our analysis focuses on the political-economy tax. It can be shown that the first-best tax t^{FB} also suffers from the same incentive problem as above. The distinct feature of t^{FB} is that it additionally considers the positive effect of raising tax on the profit of foreign exporting firms under free trade (i.e., $t^{\mathrm{FB}}=t^{\mathrm{FB}}(\theta,\lambda_x,\lambda_y^*)$).

[26] Related ideas are found in Atkeson and Lucas (1992), who explore the efficient consumption allocation to privately informed consumers, and in Athey and Bagwell (2001), who explore the efficient allocation of market to privately informed firms.

[27] My working paper (Lee, 2005) formally details this argument by using the dynamic programming tools.

then (i) the harshness of on-schedule punishment is mitigated since the value $\hat{\tau}$ is low, and (ii) the frequency of on-schedule punishments is reduced. In state (H, H), as is often observed, punishments occur neither today nor tomorrow. In state (H, L) or (L, H), inefficiencies are avoided today but punishments will occur tomorrow with probability of 1 (regardless of states). If tariffs are conditional on the current-period states, then for a large μ_H, such inefficiencies are very likely to occur both today and tomorrow. If μ_H is high enough, then the intertemporal scorekeeping enhances the efficiency of using positive tariffs to achieve incentive compatibility, and thus reduces the possibility that free trade is optimal for a sufficiently low μ_L.

7. Conclusions

This paper has examined how governments cooperate over trade and domestic policies when the sole externalities across countries are terms-of-trade motivations. The main findings can be summarized as follows. First, the high-cost government never uses domestic policies as disguised protection in an optimal agreement. Second, disguised protections with domestic policies are never commonly realized in an optimal agreement, since governments could otherwise be better off eliminating disguised protections with positive tariffs. Third, free trade (or a uniform tariff reduction) can be achieved only at the expense of domestic distortions, which may be too high in a wide range of parameters.

Descriptive accounts of domestic-policy-driven protectionism in the literature seem to differ quite markedly. While Ederington (2001) and Bagwell and Staiger (2001) in their theoretical models predict that domestic policies are not used as protective measures in equilibrium, Trebilcock and Howse (1999) report comprehensive cases where environmental regulations are used as protective measures. Ederington and Minier (2003) find empirical support for the strategic use of environmental regulations, reporting that environmental policy, as an endogenous variable, has a much stronger impact on net import levels than was previously reported. Ederington and Minier also argue that the U.S. tends to undertax import-competing industries and overtax export industries. Copeland (1990) shows that when tariff is the negotiable instrument, there will be substitution toward the inefficient instrument of protection in equilibrium. In this paper, we find that domestic distortions may be explicitly allowable to prevent "hidden protections" with domestic policies only if domestic distortions are infrequently used. If domestic distortions are commonly realized, then it would be welfare-improving for a trade agreement to include cooperation over domestic policies by letting tariffs be conditional on domestic policies.

This paper is the first to investigate a self-enforcing policy agreement when privately-informed governments are able to disguise the provision of protection to their import goods by using domestic policies. In practice, our approach has some limitations and presents some challenges for future research. First, our findings are based on a simple two-good, one-externality model. In practice, however, there are various instruments of disguised protection since countries have multiple sources of private information. Thus, it would be very costly to accurately assess the trade effects of domestic policies and implement the resulting complicated policies. As a result, the efficiencies enhanced by broadening trade agreements would be compromised by the increased "transactional costs." Second, broadening trade agreements raises a difficult and yet important question: how can national sovereignty over domestic policies be reconciled with international agreements on trade policy in the presence of disguised protectionism?

Appendix A

Proof of Lemma 1. (i) For a given policy mix (t_H, 0), define a set

$$\{(t'_H, \tau'_H) : p_x^w(t = t_H, \tau = 0) = p_x^w(t = t'_H, \tau = \tau'_H)\}.$$

Note that $p_x^w(t{=}t_H, \tau{=}0){=}p_x^w(t{=}t'_H, \tau{=}\tau'_H)$ if and only if $\tau'_H{=}[\gamma/(\beta{+}\gamma)]\,(t'_H{-}t_H)$. If the world price remains the same, then the foreign-government welfare also remains unaffected, since it is affected by changes in the home-government policies, only through movement of the world price p_x^w. Plug τ'_H into $W(\hat{p}_x, p_x^w, p_y^w)$, and then differentiate with respect to t'_H. It can then be shown that

$$\frac{\partial W}{\partial t'_H} = -(t'_H{-}\theta_H)\,\frac{\beta\gamma}{\beta+\gamma}.$$

The optimal choice for the home government is thus $t'_H{=}\theta_H$ and $\tau'_H{=}[\gamma/(\beta{+}\gamma)](\theta_H{-}t_H)$ in the defined set.

(ii) The first result shows that if the home government switches the policy mix from ((t_L, 0), (t_H, 0)) to ((t_L, 0), (θ_H, τ'_H)), then it will be better off while the foreign government is indifferent. Thus there exists a lower tariff $\tau''_H{<}\tau'_H$ such that the home government is indifferent while the foreign government is better off, under a new policy mix ((t_L, 0), (θ_H, τ''_H)). □

Proof of Lemma 2. The proof, provided in the text, will be complete if

$$W_x(t = t_L, \tau = 0; \theta_L) \geq W_x(t = \theta_H, \tau = \tau''_H; \theta_L).$$

From on-IC$_L^0$ in the text, it is known that the low-cost government prefers (t_L, 0) to (t_H, 0):

$$W_x(t = t_L, \tau = 0; \theta_L) \geq W_x(t = t_H, \tau = 0; \theta_L).$$

Thus it suffices to prove

$$W_x(t = t_H, \tau = 0; \theta_L) \geq W_x(t = \theta_H, \tau = \tau''_H; \theta_L). \tag{A1}$$

Note that the policy mix (θ_H, τ''_H) is defined such that

$$W_x(t = t_H, \tau = 0; \theta_H) = W_x(t = \theta_H, \tau = \tau''_H; \theta_H). \tag{A2}$$

Consider now the function $W_x(t,\tau;\theta_H)$ that crosses those two indifferent points, (t_H, 0) and (θ_H, τ''_H), where $t_H{<}\theta_H$ and $0{<}\tau''_H$. Then, a linear function that is tangent to $W_x(t,\tau;\theta_H)$ at (θ_H, τ''_H) crosses a point ($\tilde{t}$, 0), where $\tilde{t}{>}t_H$. Since this linear function crosses two points, ($\tilde{t}$, 0) and (θ_H, τ''_H), its slope is given by

$$\frac{\tau''_H{-}0}{\theta_H{-}\tilde{t}} = -\frac{\partial W_x(t,\tau;\theta_H)/\partial t}{\partial W_x(t,\tau;\theta_H)/\partial \tau}\bigg|_{t=\theta_H,\tau=\tau''_H} = \frac{\gamma}{\beta+\gamma}. \tag{A3}$$

Rewrite the LHS of Eq. (A1) as

$$W_x(t = t_H, \tau = 0; \theta_L) = W_x(t = t_H, \tau = 0; \theta_H) + (\theta_H{-}\theta_L)Q_x(t = t_H, \tau = 0). \tag{A4}$$

Under the same policy mix (t_H, 0), both low- and high-cost governments would face the same world and local prices with no tariff revenue. The only differential in their welfare functions is that

the high-cost government has the term $(t_H-\theta_H)Q_x(t=t_H, \tau=0)$ while the low-cost government has the term $(t_H-\theta_L)Q_x(t=t_H, \tau=0)$. Thus the RHS of Eq. (A4) is

$$\begin{aligned} &W_x(t=t_H, \tau=0; \theta_H) + (\theta_H-\theta_L)Q_x(t=t_H, \tau=0) \\ &\quad = W_x(t=\theta_H, \tau=\tau_H''; \theta_H) + (\theta_H-\theta_L)Q_x(t=t_H, \tau=0) \\ &\quad = W_x(t=\theta_H, \tau=\tau_H''; \theta_L) + (\theta_H-\theta_L)(Q_x(t=t_H, \tau=0)-Q_x(t=\theta_H, \tau=\tau_H'')). \end{aligned}$$

The first equality is direct from Eq. (A2). The second equality is also immediate: the low-cost government has an additional efficiency cost $(\theta_H-\theta_L)Q_x(t=\theta_H, \tau=\tau_H'')$ under the policies (θ_H, τ_H'').

The proof of Eq. (A1) then boils down to the proof of

$$Q_x(t=t_H, \tau=0) > Q_x(t=\theta_H, \tau=\tau_H'').$$

Since $Q_x(\cdot)$ strictly increases in price, the inequality holds if and only if

$$\hat{p}_x^s(t=t_H, \tau=0) > \hat{p}_x^s(t=\theta_H, \tau=\tau_H''),$$

which in turn is equivalent to

$$\frac{2\beta+\phi}{\beta+\phi} > \frac{\tau_H''-0}{\theta_H-t_H}. \tag{A5}$$

To prove that Eq. (A5) holds, note first that

$$\frac{\gamma}{\beta+\gamma} = \frac{\tau_H''-0}{\theta_H-\tilde{t}} > \frac{\tau_H''-0}{\theta_H-t_H},$$

where the equality is from Eq. (A3) and the inequality is due to $\tilde{t} > t_H$. From the assumption made on the parameters,

$$\frac{2\beta+\phi}{\beta+\phi} > \frac{\gamma}{\beta+\gamma}.$$

Hence, the inequality Eq. (A5) holds. □

Proof of Corollary 1. (ii) Under free trade, the first-best choice of t_L from a worldwide perspective is θ_L. Lowering t_L below θ_L or raising it above θ_L causes some inefficiencies; either way, the worldwide cooperative welfare symmetrically decreases for a given $\tau=0$, as was implied by the first-order condition (4) in the absence of the terms-of-trade term. If the gap $\theta_H-\theta_L$ is sufficiently small, then governments would prefer assign t_L to θ_H rather than to ℓ_L, which means that a pooling with $t_L=t_H=\theta_H$ would be preferred to a separating of $t_L=\ell_L$ and $t_H=\theta_H$, so as to achieve incentive compatibility. This implies that if $\theta_H-\theta_L$ is sufficiently small, then the "optimal" pooling with $t_L=t_H=E(\theta)$ is preferred to the separating with $t_L=\ell_L$ and $t_H=\theta_H$. The optimal pooling, in turn, is dominated by a separating with $t_L=E(\theta)$ and $t_H=\theta_H$ for some $\tau_H>0$. □

Proof of Lemma 4. (i) Plugging $\hat{p}_x^s(t, \tau)$ into the equation $t=\theta-(\lambda_x-1)Q_x(\hat{p}_x^s)/\gamma$ yields

$$t^{\mathrm{PE}}(\theta, \lambda_x; \tau) = \frac{\theta(\phi+\gamma+2\beta)-(\lambda_x-1)(2\alpha+(\beta+\phi)\tau)}{\phi+\gamma+2\beta-(\lambda_x-1)(\phi+2\beta)}.$$

Given the parameter range in the text, t^{PE} rises with θ but falls with λ_x for a given τ.

(ii) We first prove the sufficiency. The first derivatives of the domestic welfare function are

$$\frac{\partial W_x}{\partial \tau} = (\beta+\gamma)M_x(\hat{p}_x) - (\beta+\phi)(\beta+\gamma)\tau + \gamma(\beta+\phi)(t-\theta) + (\lambda_x - 1)(\beta+\phi)Q_x\left(\hat{p}_x^s\right)$$

$$\frac{\partial W_x}{\partial t} = -\gamma M_x(\hat{p}_x) + \gamma(\beta+\phi)\tau - \gamma(2\beta+\phi)(t-\theta) - (\lambda_x - 1)(2\beta+\phi)Q_x\left(\hat{p}_x^s\right).$$

Consider a linear function that is tangent to the domestic welfare function and has slope $\gamma/(\beta+\gamma)$. Let the domestic government choose any policy mix along the linear function. Then the first two terms in both equations, corresponding to $-M_x(\partial p_x^w/\partial\tau)+\tau(\partial M_x/\partial\tau)$ and $-M_x(\partial p_x^w/\partial t)+\tau(\partial M_x/\partial t)$, are reduced to zero, since p_x^w and M_x are held constant along the line. Hence, the first-order conditions lead to $t=\theta-(\lambda_x-1)Q_x(\hat{p}_x^s)/\gamma$, and thus $t=t^{\mathrm{PE}}(\theta,\lambda_x;\tau)$.We next prove the necessity. If $t=t^{\mathrm{PE}}(\theta,\lambda_x;\tau)$, then the last two terms in both equations are reduced to zero. Hence, the tangent of the domestic welfare function has the slope $d\tau/dt=-(\partial W_x/\partial t)/(\partial W_x/\partial\tau)=\gamma/(\beta+\gamma)$. □

References

Athey, S., Bagwell, K., 2001. Optimal collusion with private information. RAND Journal of Economics 32, 428–465.

Atkeson, A., Lucas Jr., R.E., 1992. On efficient distribution with private information. Review of Economic Studies 59, 427–453.

Bagwell, K., Staiger, R.W., 2001. Domestic policies, national sovereignty, and international economic institutions. Quarterly Journal of Economics 116, 519–562.

Bagwell, K., Staiger, R.W., 2002. The Economics of The World Trading System. MIT Press, Cambridge, London.

Bhagwati, J., Ramaswami, V.K., 1963. Domestic distortions, tariffs and the theory of optimum subsidy. Journal of Political Economy 71, 44–50.

Copeland, B.R., 1990. Strategic integration among nations: negotiable and non-negotiable trade barriers. Canadian Journal of Economics 23, 84–108.

Ederington, J., 2001. International coordination of trade and domestic policies. American Economic Review 91, 1580–1593.

Ederington, J., 2002. Trade and domestic policy linkage in international agreements. International Economic Review 43, 1347–1367.

Ederington, J., 2003. Policy linkage and uncertainty in international agreements. Economic Inquiry 41, 305–317.

Ederington, J., Minier, J., 2003. Is environmental policy a secondary trade barrier? An empirical analysis. Canadian Journal of Economics 36, 137–154.

Feenstra, R.C., Lewis, T.R., 1991. Negotiated trade restrictions with private political pressure. Quarterly Journal of Economics 106, 1287–1307.

Fudenberg, D., Levine, D.J., Maskin, E., 1994. The folk theorem with imperfect public information. Econometrica 62, 997–1039.

Hungerford, T.L., 1991. GATT: a cooperative equilibrium in a cooperative trading regime? Journal of International Economics 31, 357–369.

Jensen, R., Thursby, M., 1990. Tariffs with private information and reputation. Journal of International Economics 29, 43–67.

Johnson, H.G., 1965. Optimal trade intervention in the presence of domestic distortions. In: Caves, R.E., Johnson, H.G., Kenen, P.B. (Eds.), Trade, Growth and the Balance of Payments. North-Holland, Amsterdam, pp. 3–34.

Lee, G., 2005. Trade Agreements with Domestic Policies as Disguised Protection, Mimeo, Singapore Management University.

Limão, N., 2005. Trade policy, cross-border externalities and lobbies: do linked agreements enforce more cooperative outcomes? Journal of International Economics 67, 175–199.

Petersmann, E.-U., 1997. The GATT/WTO Dispute Settlement System: International Law, International Organizations and Dispute Settlement. Kluwer Law International, London, pp. 135–176.

Riezman, R., 1991. Dynamic tariffs with asymmetric information. Journal of International Economics 30, 267–283.

Spagnolo, G., 2001. Issue linkage, delegation, and international policy cooperation. CEPR Discussion Paper, vol. 2778.

Trebilcock, M.J., Howse, R., 1999. The Regulation of International Trade. Routledge, New Fetter Lane, London.